
GETTING STARTED GUIDE

X91GNSS



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FCC Notice

CHC X91 receivers comply with the limits for a Class B digital device, pursuant to the Part 15 of the FCC rules when it is used in the Portable Mode.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Replacing Radio Transmitter Power Fuse

Radio transmitter is protected by a 5-A fuse inserted in the power cable. This Y-shaped cable is used to connect the car battery to the CHC Datalink.

When you have to replace this fuse, please get a spare fuse, 5 A, ATO type, and then do the following:

Unplug the battery end of the data/power cable

Open the fuse holder located along the data/power cable

Extract the damaged fuse

Insert the new fuse and then push the holder lid back into place

Connect the power cable back to the battery

Where to Find Information

This manual is designed to guide you through the basic X91 procedures. For more information please contact CHC via email at support@chcnav.com or via Skype at chc_support.

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1. INTRODUCTION

Thank you for choosing CHC X91GNSS receivers.

This Getting Started Guide is designed to help you to rapidly familiarize yourself with your new equipment. Only a selection of the many CHC X91 GNSS functions is presented in this guide.

1.1 Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, contact your local Dealer. Alternatively, please request technical support using the CHC Website at (www.chcnav.com) or CHC technical support email support@chcnav.com.

1.2 Your Comments

Your feedback about the supporting documentation will help us to improve the products. Please e-mail your comments to support@chcnav.com.

1.3 Safety Information

This manual describes CHC X91 GNSS Receivers. Before you use your receiver, please make sure that you have read and understood this publication, as well as safety requirements.

1.3.1 Warning and Cautions

An absence of specific alerts does not mean that there are no safety risks involved.

A Warning or Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.



WARNING-A Warning alerts you to a likely risk of serious injury to your person and/or damage to the equipment.



CAUTION- A Caution alerts you to a possible risk of serious injury to your person and/or damage to the equipment.

1.3.2 Regulations and Safety

The receivers contain integral Bluetooth® wireless technology, and may also send radio signals through an externally-connected data communication radio. Regulations regarding the use of the datalink vary greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. But in some countries the administrative permissions are required. For license information, consult your local dealer. Bluetooth® operates in license-free bands.

1.3.3 Use and Care

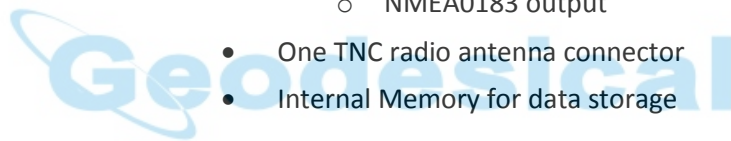
The receiver can withstand the rough treatment that typically occurs in the field. However, the receiver is high-precision electronic equipment and should be treated with reasonable care.

2. GENERAL INFORMATION

2.1 Overview

The X91 receiver provides the following features:

- Centimeter-accuracy, real-time positioning with RTK/OTF data.
- Sub-meter-accuracy, real-time positioning using pseudo-range corrections.
- Automatic OTF initialization while moving
- Single Lithium-ion rechargeable battery
- Cable-free Bluetooth® communications with the data controllers
- One 10-Pin LEMO port for:
 - RTCM 2.X and 3.0 input and output
 - CMR input and output
 - NMEA0183 output
- One TNC radio antenna connector
- Internal Memory for data storage



2.2 Technical Specification

GNSS characteristic

- 220 channels with simultaneously tracked satellite signals :
 - GPS: L1C/A, L2C, L2E, L5
 - GLONASS: L1C/A, L1P, L2C/A, L2P
 - SBAS: WAAS, EGNOS, MSAS
 - Galileo: GIOVEA and GIOVEB
 - Forthcoming Signals

Real Time Kinematics (RTK)

- Horizontal: $\pm (10\text{mm}+1\text{ppm})$ RMS
- Vertical: $\pm (20\text{mm}+1\text{ppm})$ RMS
- Initializing Time: 10S
- Initialization Reliability: Typical >99.9%

Static

- Horizontal: $\pm (2.5\text{mm}+1\text{ppm})$ RMS

General Information

- Vertical: \pm (5+1ppm) RMS
- Baseline Length: \leq 300km

Data Format

- RTCM2.1, RTCM2.3, RTCM3.0, CMR, RTCA, Input and Output
- NMEA0183 outputs, GSOF outputs

Physical Reference

- Size (HxD): 80mm×180mm
- Weight: 1.25Kg (Battery Included)

Electrical Reference

- Power Consumption: 2.6W
- Battery Volume: 2400mAh
- Battery Life: 9 Hours (Static), 5 Hours (RTK)
1000 Recharges
- External Power: 9-18VDC

Environment

- Working Temperature: -30 °C — +65 °C
- Storage Temperature: -40 °C — +75 °C
- Humidity: 100% condensation
- Waterproof and Dustproof: IP67, protected from temporary immersion to depth of 1 meter, floating.
- Shock and Vibration: Survive from 2 meters drop onto concretes

Characteristics

- Buttons and Display: 2 buttons/4 LED lights
- I/O: RS232, High-speed USB, Bluetooth®
- Channel: 220 Channels*

Datalink

- Power (UHF): 1W-20W Adjustable
- Band Width: 410-430MHz/430-450MHz/450-470MHz

*Channel Configuration:

-GPS: Simultaneous L1 C/A, L2E, L2C, L5

-GLONASS: Simultaneous L1 C/A, L1 P, L2 C/A, L2 P

- SBAS: Simultaneous L1 C/A, L5
- GLOVE-A: Simultaneous L1BOC, E5A, E5B, E5AltBOC
- GLOVE-B: Simultaneous L1 CBOC, E5A, E5B, E5AltBOC









2.3 Product Basic Supply Accessories

The tables below provide an overview of the different items composing the CHC X91 Base Kit. Basic Supply is the standard accessories for each kit.

Base Kit Basic Supply


Item	Picture
CHC X91GNSS Receiver Base	
Lithium Battery	
H.I. Tape	
Connector	

Rover Kit Basic Supply

Item	Picture
CHC X91GNSS Receiver Rover	
Lithium Battery	
Battery Charger	
Power Adapter with Cord	
GPS to PC Data Cable	
Receiving Radio Antenna	
Connector	
2M Range Pole	

Geodetical

Datalink Kit Basic Supply

Item	Picture
CHC DL3 Datalink	
GPS to Datalink Cable	
Standard Datalink Antenna with 5 Meter Cable	
External Power Cable	
Datalink Antenna Mounting Pole Kit	
Pole Mounting	

Geodesical

2.4 Product Option Supply Accessories

You may have one of the 4 Handheld Controllers depending on different requirement and purchase.




LT30 Controller Kit Basic Supply

Item	Picture
LT30 Survey RTK Controller(the controller is different according to your order, you may order Getac or Recon 400)	
USB Data Cable of Controller	
Battery Charger and Adapter of Controller	
Battery	
TF Card	

Geodesical




Also there are some more Accessories for your consideration. Transportation Cases Options and Accessories Options are depending on different orders requirements.

**Transportation Cases
Options**

Item	Picture
Transport Case	
Carry Pouch	
Metal Transport Case for Poles and Antenna	

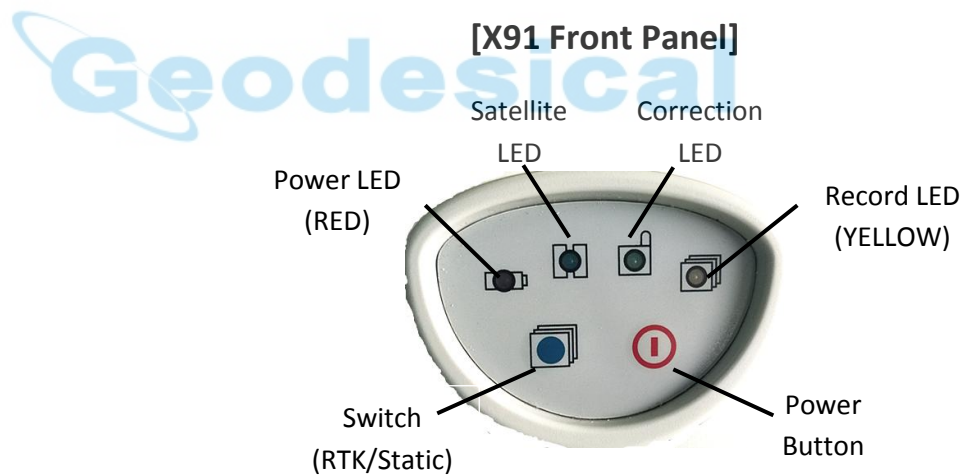
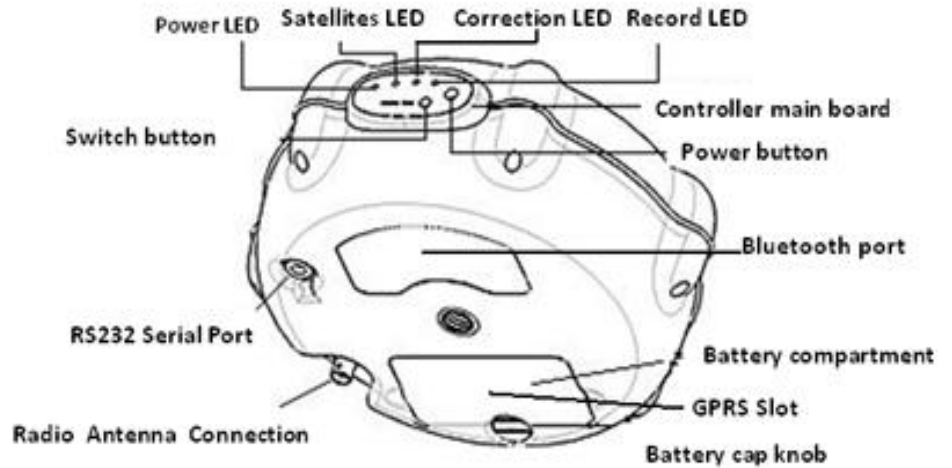
Accessories Options



Item	Picture
Double Bubbles Tribrach with High Adapter	
Single Bubble Tribrach with Lower Adapter	
External Power Cable	

3. PRODUCT VIEW

3.1 Receiver



ⓘ Power Button

To turn on X91GNSS, quick press the power button until the power LED (red) lights up. **After the receiver powers on, the other three LED will flash together for one time.**

📄 Switch Button

The function of switch button is to switch X91GNSS from RTK mode to static mode. The procedure can be divided into 2 steps.

Step 1: Switching

Long press the button until the Record LED off.

Step 2: Checking

Press the switch button, if the correction LED turns on, it means the switching succeed.



CAUTION: When checking is going on, do not long press, otherwise RTK mode will be activated.

● Power LED (RED)

- The indicator to show whether X91GNSS is on or off.
When battery is less than 20%, the power LED will flash continuously which reminds you to change the battery.
- Bluetooth status: after the receiver powers on, if the power LED (red) flashes quickly for three times in a row, it means the

● Satellite LED (BLUE)

The indicator to show the number of satellites that the receiver has tracked. For example, if the blue LED flashes five times continuously, it means the receiver has tracked 5 satellites.

● Correction LED (GREEN)

The Correction LED only flashes once per second when

- A. As a Base station: successfully transmitting differential data in RTK mode.
- B. As a Rover station: successfully receiving differential data from Base station.

● Record LED (YELLOW)

The record LED only flashes under two situations

- A. In static mode

The interval of flashing shows the sample interval of collecting data.

- B. RTK mode

When the receiver is connecting to Controller and receiving commands or just communicating with Controller.

[X91 Ports]**❖ RS232 Serial Port**

RS232 serial port is a 9 pin 0-shell LEMO connector that supports RS-232 communications or external power input.

❖ Bluetooth® Port

Bluetooth® port is an integrated port allowing X91GNSS receiver to communicate with a Bluetooth®-enabled field terminal.

❖ Radio Antenna Connection (only for Rover)

It allows you to connect a radio whip antenna to the X91GNSS. There is only one type of CHC radio antenna connection --- TNC.

❖ **Adaptor**

The 5/8" adaptor is used for setting up the receiver on the tripod.

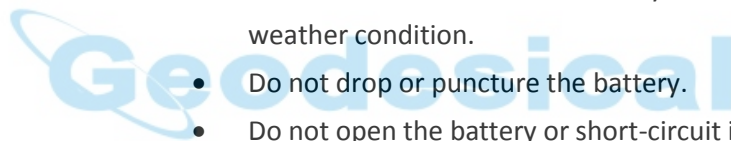
❖ **Battery Compartment**

Please put CHC made battery into the compartment properly



WARNINGS:

- Do not store batteries in the receiver unless it is applied.
- Do not charge or use the battery if it appears to be damaged or leaking.
- Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage.
- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle under hot weather condition.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.



❖ **GPRS Slot**

The slot to insert SIM card, which can provide GPRS wireless net as data communication channel between base and rover. This method can be activated only in the areas which are covered by GPRS signals of local Mobile service company.

3.2 Software Installation

3.2.1 Introduction of Software

HCGPSSet : fieldwork software for the Receiver setup



CAUTION: The setting can work only after the Receiver being turned off and turned on, and this setting need only to do once if the setting will not be changed next time.

SurvCE: RTK Surveying software.

3.2.2 Installation of the CHC RTK Software

- The HCGPSSet software can be copy directly to both PC and the controller, and also can be used directly.
- The SurvCE software is to be installed by synchronous with PC. First to install Microsoft Activesync into PC if the PC is not Win 7 operation system, the software is available at <http://www.microsoft.com/en-us/download/details.aspx?id=15> Second, connect Controller with PC, run Microsoft Avtivesync, double click the installation file of SurvCE and follow the installation procedure.

3.3 Batteries and Power



WARNING-Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage.

To prevent injury or damage:

- Do not charge or use the battery if it appears to be damaged or leaking.
- Charge the Lithium-ion battery only in a CHC product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
- Discontinue charging a battery that gives off extreme heat or a burning odor.
- Use the battery only in CHC equipment that is specified to use it.
- Use the battery only for its intended use and according to the instructions in the product documentation.



WARNING –Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage.

To prevent injury or damage:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.

- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle under hot weather condition.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.



WARNING-Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage.

To prevent injury or damage:

- If the battery leaks, avoid with the battery fluid.
- If battery fluid gets into your eyes, immediately rinses your eyes with clean water and seek medical attention. Please do not rub your eyes!
- If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

3.3.1 External Power supply



Figure3.3.1-1

We have two methods to provide the external power to the receiver by the CHC GPS to PC cable+ Power Adapter or CHC GPS to PC cable+ external power cable (option purchase)+ car battery.

- In the office, the Power Adapter is connecting with AC power of 100-240V, the output port of the Power Adapter connects with the Power Port of the GPS to PC cable, shown as **Figure3.3.1-1**.
- In the field, the external power cable is connecting with the Car battery, the output port of the external power cable connects with the Power Port of the GPS to PC cable, shown as **Figure3.3.1-2**.



Figure3.3.1-2

3.3.2 Internal Battery

Two rechargeable lithium-ion batteries are supplied with the receiver.

• Recommendations for the battery daily use

The rechargeable Lithium-ion battery is supplied partially charged. The following recommendations provide optimal performance and extend the life of your batteries:

- Fully charge all new batteries prior to use.
- Do not allow the batteries to discharge below 5 V.
- Keep all batteries on continuous charge when not in use. Batteries may be kept on charge indefinitely without damage to the receiver or batteries.
- Do not store batteries in the receiver or external charger unless power is applied.
- If you must store the batteries, fully charge them before storing and then recharge them at least every three months.

● Charging the Battery

The battery fully charged will take approximately three hours each using the charger attached.

- Connect the Power Adapter and the charger together.
- The red LED in the middle indicates the charger is powered on.
- When the battery is placed in the right place, the Green/Yellow LED will start to flash or turn on.
- The Green/Yellow LED indicates the statement of charging. When it is flashing, it means the battery is on charging, and the flashing speed tells the progressing of the battery charging, in other words, when the battery fully charged, the Green/Yellow LED will keep lighting but no flashing any more.

● Battery Disposing Notices

Discharge the lithium-ion battery before dispose of it. When disposing the battery, be sure to do so in an environmentally sensitive manner. Adhere to any local and national regulation concerning battery disposal or recycling.

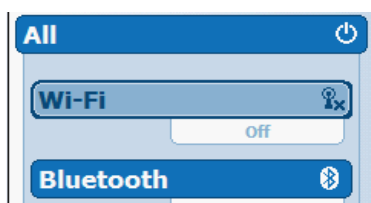
4. Establish connection between controller and Receiver.

You can connect the receiver with controller using data cable or by Bluetooth. The CHC RTK software can be installed in Windows® CE and Windows® Mobile system Controller. Here the Windows® Mobile is set as an example to show how to establish connection with Receiver.

4.1 Connecting via data Cable

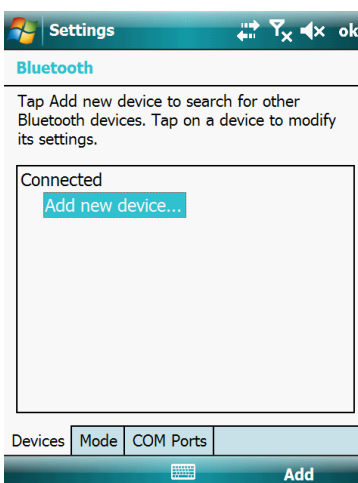
Turn on the controller and the GNSS receiver you want to work with. Connect the controller and the Receiver using GPS to PC cable, the default Com Port is **1**.

Tips: There is a lock in the Lemo, when you touch in the cable, please use caution. Do touch the metal part of the Lemo not the plastic part.



Tap here to change the Bluetooth® status

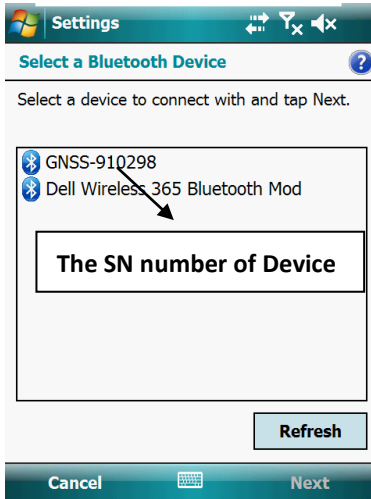
Figure4.2-1



4.2 Connecting via Bluetooth

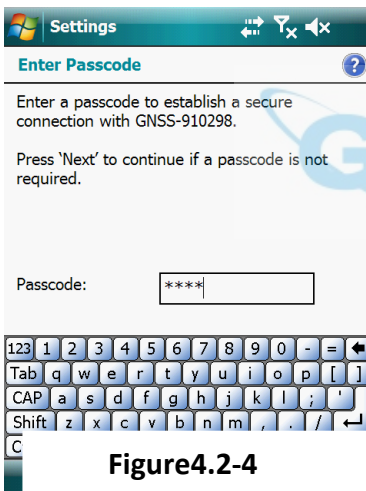
- Turn on the controller and the GNSS receivers you want to work with.
- Activate Bluetooth® connection of controller. Check the Bluetooth® status on the start screen. Turn on the Bluetooth by tap on the Bluetooth® button, **Figure4.2-1**. Tap **Done** and return to the start screen.
- Start Bluetooth Settings Tap **Start** -> **Settings** -> **Connections** -> **Bluetooth®**. Tap on the Bluetooth® icon. The Bluetooth® Settings window opens, which is on the **Device** tab, **Figure4.2-2**.

Figure4.2-2



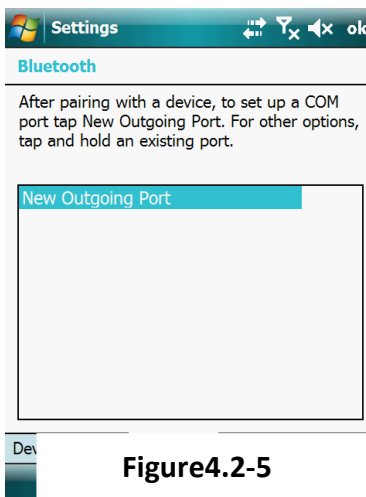
- Add new device to the list
Tap on **Devices**->**Add New device**, the PAD start searching for the Bluetooth® devices nearby. For each device detected by Controller, the Bluetooth® name is returned in the search window (e.g.GNSS-400071). The **Refresh** button can be used to resume the search if necessary.

Figure4.2-3



- Select the Bluetooth® name corresponding to the receiver you want to communicate with and then tap **Next**, keying in the Passcode “1234” , **Next**->**Done**.

Figure4.2-4



- Establish a Bluetooth Communication
Now come to the **COM Ports** Tab, select the **New Outgoing Port**. Highlight the device name, and then tap **Next**.
Choose a COM port to connect Bluetooth® with the GNSS receiver. Choose **Com8** or **Com9**, then unselect the **Secure Connection**, tap **Finish**. Click **OK** on the top right corner to exit Bluetooth setting.

Figure4.2-5

Notice: **Com8** is suggested to be linked with Base and **Com9** with Rover.



CAUTION: If you want to connect a new receiver to the Controller using the same Com Port, You should delete the Bluetooth® connection with GNSS Device which is using the Com Port first in the **COM Ports** Tab. Long press the device name, select delete option in the pop out window.



5. CONFIGURATION AND OPERATION

5.1 Static Configuration

There are 3 ways to configure the receiver into Static Mode.

A. Using RS232 Port and HcLoader Software in the Office

- Connect X91GNSS to your computer through RS232 cable.
- Run the software HcLoader and click icon **Link** to make the receiver connected with computer.
- Click icon **Setup** to set the sample interval (15S is recommended) and mask angle of the receiver (13 is recommended) and choose **Data Log** mode as **Auto**, then click **Apply** to make the configuration active, click **Exit**.
- Restart the receiver.

B. Using Controller and Software HCGPSSet in the Field

- Use RS232 or Bluetooth® port connecting Controller with receiver.
- Tap the icon **HCGPSSet** on the Controller, choose the right com port and click **Bluetooth®** icon if you are using Bluetooth®.
- Click **Open**, set the sample interval (15S is recommended) and mask angle of the receiver (13 is recommended) you want and choose the data log mode as Auto, then click **Apply** to make the configuration active.
- Restart the receiver.

C. Switch Button in the Field

- Long press the Switch button until the Record LED off record LED (the fourth LED) is off.

5.2 Real-Time Kinematic Configuration

To do the RTK, Radio or Ntrip must be chose to be the way to transmit correction messages, X91 offers both these two ways by using “CHC Radio + Base Station” or “GPRS Network + CORS”. Now

we divide these two ways into 3 modes: Radio Mode, GPRS Mode and DCI mode, and the configurations are shown in the table below:

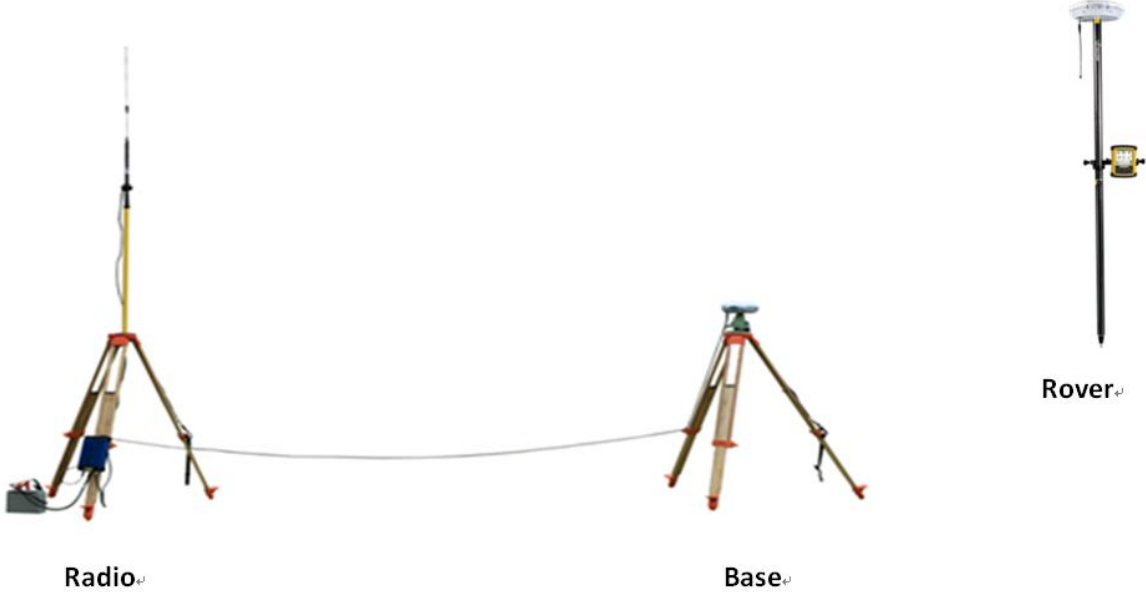

<p>Radio Mode</p>	 <p>The diagram illustrates the Radio Mode setup. On the left, a 'Radio' unit is mounted on a tripod and connected to a car battery. A cable runs from the Radio to a 'Base' unit, also on a tripod. To the right, a 'Rover' unit is shown on a vertical pole. The Rover unit has a yellow display screen and a small antenna on top.</p>
<p>DCI (Data Collector Internet) Mode</p>	 <p>The diagram shows the DCI Mode configuration. A 'Rover' unit is mounted on a vertical pole. A SIM card is shown being inserted into a slot on the side of the Rover's yellow display unit. A large blue watermark reading 'Geodesical' is overlaid on the image.</p>

Table 5.2-1 Configuration for Radio Mode

Radio Mode: install the instruments like the figure in **Table 5.2-1**

- Set up the **Base** on the Known or Unknown Point.
- Set up the **Datalink** and **Antenna** Near the Base.
- Connect the car battery, the Radio, the Antenna and the Base with relative cables like the following picture.

CAUTION: The Datalink must be connected in right order, Antenna first, and then GPS. The most important, power cable the last.

DCI (Data Collector Internet) Mode:

Insert the SIM card into the SIM card slot on the controller, screw the rover receiver on the pole, and put the controller adapter in the right place like the figure in **Table 5.2-1**.

5.2.2 Datalink setting

1. General specification

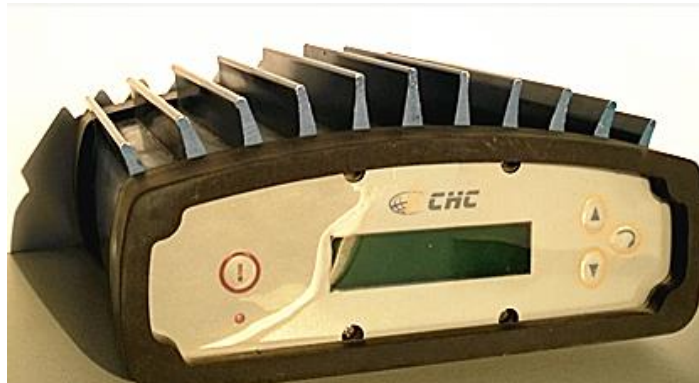


Figure5.2.2-2

Dimension: 23.5cmL X 13cmW X 6.5cmH

Weight: 1.9kg

Communication: RS-232 port

User interface: 1 LED Digital screen, 4 Buttons

External power: 12V DC

Baud rate: 4800 9600 19200 bps

Protocol: CHC

Frequency bands: 438-470 MHz

RF Transmitter output: 1-20W

Operating temperature: -40 °C -----+65 °C

2. Connection

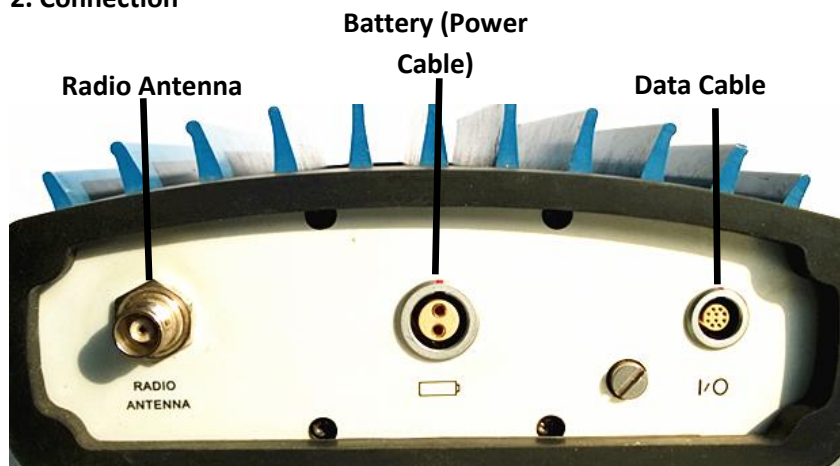


Figure5.2.2-2

Radio antenna: This socket is for fixing CHC made antenna on the Radio.

Battery: This socket is for using CHC made power cable to link the Radio to the Car battery (insuring the red point match the red point).

Data: This socket is for using CHC made data cable to link the Radio to the receiver.



WARNING: There is sequence for the cables linking to DL3: first please fix the radio antenna, and then power cable, and last the data cable.

3. Control panel

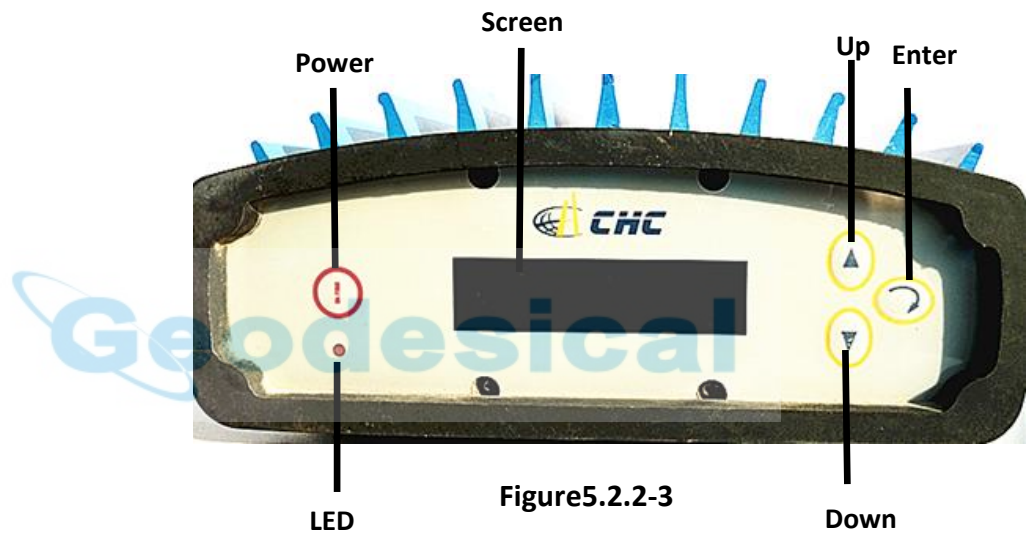


Figure5.2.2-3

Power Button: When you press this button, the front page will show on the screen

LED: This LED will flash once per second when the radio successfully sends out the correction data.

Screen: The system information and setting information of the datalink would be showed in the LED screen.

Up Button: when you press this button, the cursor on the screen will move up

Down Button: when you press this button, the cursor on the screen will move down.

Enter Button: when you press this button, it will make the configuration work.



Figure5.2.2-4

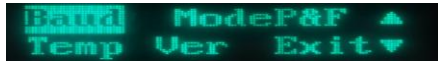


Figure5.2.2-5



Figure5.2.2-6



Figure5.2.2-7



Figure5.2.2-8



Figure5.2.2-9



Figure5.2.2-10



Figure5.2.2-11



Figure5.2.2-12



4. Configuration

When you switch on DL3, you will see this picture

1) Reading the current configuration of Radio

Choosing icon **info** and pressing **Enter**, you will see the current configuration Baud, Mode, P &F, Temp and Version of the Radio.

CAUTION: The **info** can be used in the checking after changing the Radio parameters.

2) Setting the configuration of Radio

Choosing icon **Set** and pressing **Enter**, you will see this picture, and then you can start to set up DL3

A. Baud

Choosing icon **Baud** and pressing **Enter**, you will see 3 Baud rate **4800**, **9600** and **38400**. For CHC Rover station, please choose Baud rate **9600** and press **Enter** to make the configuration work.

B. Mode

Choosing icon **Mode** and pressing **Enter**, you will see 4 modes, they are **Receive**, **Transmit**, **Relay** and **R&T**, if using Radio to transmit the correction data from Base station to the Rover, please choose **Transmit** and press **Enter** to make the configuration work.

C. Noise

Choosing icon **Noise** and pressing **Enter**, you will see it asking you to find Noise YES or NO to detect where there is one radio station having the same Frequency.

D. P &F

Choosing icon **P&F** and pressing **Enter**, you will see **Powset** and **Freset**.

First, choosing **Powset** and pressing **Enter**, setting how much watt you want then press icon **Enter**. For CHC DL3 power is from 1W to 20W, and each adding value is 1W.

Second, choosing **Freqset** and pressing **Enter**, please set frequency as xxx.050 then press icon **Enter**.

Figure5.2.2-13



Figure5.2.2-14

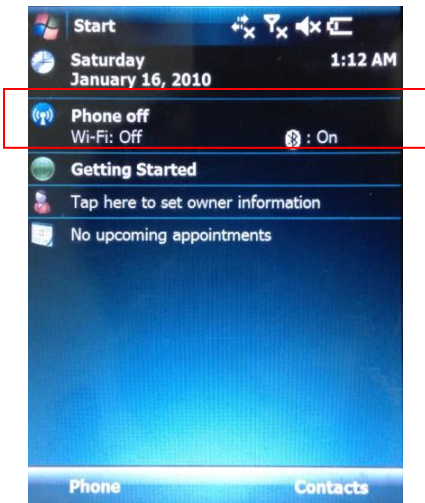
E. LED

Choose icon **LED** and press **Enter**, you will see icon **add** and **sub**, you can choose **add** or **sub** and press **Enter** to regulate the light of screen.



CAUTION: After changing the radio settings, please choose Enter to active the setting, otherwise the setting will not come into function.

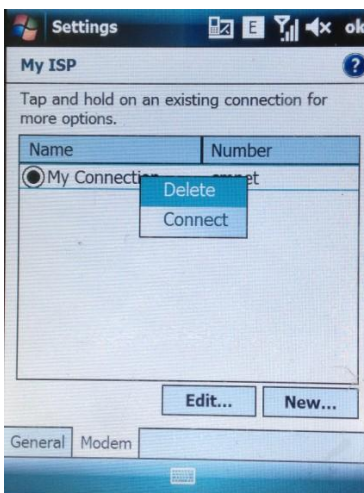
 **Geodesical**



Appendix A-1



Appendix A-2



Appendix A-3

Appendix A Log Controller on Internet

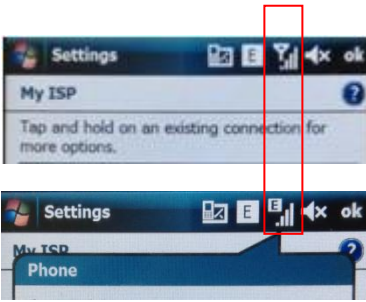
Comparing to GPRS Mode, DCI Mode also connects to internet by GPRS NET to get Correction Message, the difference is that the SIM card is inserted into Controller directly not the Receiver.

Log Controller on Internet

- Insert the SIM card into the slot located at the same place as battery compartment
- Establish the internet connection on Controller (e.g. Windows Mobile 6.1)
 - Active Phone function on Controller: click the icon **Phone/Wi-Fi/Bluetooth** on the desktop of Controller, shown as the figure on the left.

- Click **Phone** icon to active it, then click **Done**

- To establish a new connection on Controller, follow the route **Start** → **Settings** → **Connections Tab** → **Connections**:
 - Select **Add a New Modem Connection** option, give the new connection a name and select **Cellular Line (GPRS)** Modem then click **Next**. Input the **Access Point Name**, **Next** again, input **User name**, **Password** and **Domain** if offered by GPRS Servers Provider. Click Finish, in the new window shown on the left choose **Manage Existing Connections**.
 - You will see the new connection listed here, long press the connection name and select **Connect** from the pop out list.

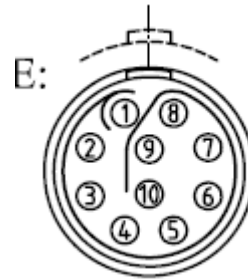


Appendix A-4

- Check whether the connection success or not, compare the two statement on the top of the screen, shown in the Figure on the left, the first one is the normal one, the second is succeeded connected.



Appendix B CHC receiver 10 PIN LEMO definition



PIN	Signal Name	Description
1	TXD	Transmit Data(PC receive data through this pin)
2	RXD	Receive Data(PC transmit data through this pin)
3	PWR	External Power Input (9-15 V DC)
4	PWR	External Power Input (9-15 V DC)
5	GND	External Power Ground
6	GND	External Power Ground
7	USB PWR	
8	D-	
9	D+	
10	Not Used	

Last reviewed on Mar 14 2014